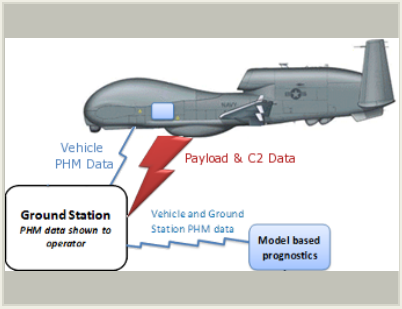
Sensor-Free Health Management System, Phase I

Completed Technology Project (2013 - 2013)

Project Introduction

The availability of an air vehicle to perform missions or generate sorties is negatively impacted by time spent on the ground due to scheduled servicing and maintenance. Condition Based Maintenance (CBM) helps maximize the availability of air assets by servicing the air vehicle based on actual condition as opposed to a fixed number of operating hours. Prognostics and Health Management (PHM) enables improved CBM on air vehicles by comparing in-situ sensor data to prognostic models of components and subsystems to predict wear as it occurs. Integration of these PHM systems with an autonomic logistics infrastructure can lead to even greater increases in sortie generation rates and decreases in maintenance cost and logistics burden by eliminating unnecessary preventative maintenance as well as identifying failures occurring outside the normal scheduled maintenance cycle. Aurora's innovative approach utilizes information from existing sensors (i.e., does not require additional sensors added to the vehicle, hence, 'sensor-free') to determine PHM. Current implementation of PHM is focused on new designs of manned aircraft to allow co-development of the PHM system and its specific sensors. Unmanned Aerial Systems (UAS) have sensors and subsystems already installed that can provide the capability for a PHM retrofit on in-fleet systems. UAV specific subsystems, such as the autopilot, also provide the opportunity for new PHM capabilities beyond those considered in manned aircraft. Aurora proposes the Integrated Vehicle Health Management System (IVHMS). Aurora's IVHMS will compare models of the aircraft in different configurations to an estimate of the current state of the aircraft in order to generate a better understanding of the real-time operating condition of the vehicle and its constituent components. The IVHMS uses these capabilities to generate a vehicle-wide identification of systems in order to detect faults as they influence overall performance.



Sensor-Free Health Management System

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Organizational Responsibility

Responsible Mission Directorate:

Space Technology Mission Directorate (STMD)

Responsible Program:

Small Business Innovation Research/Small Business Tech Transfer

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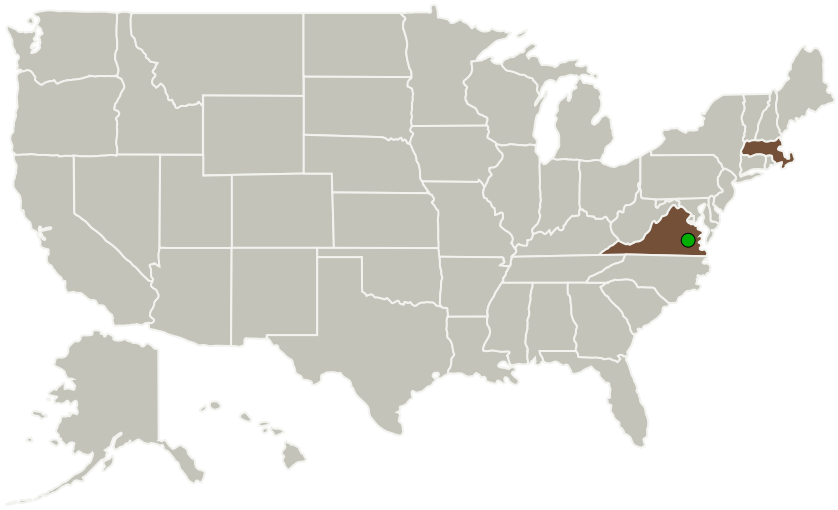
Primary U.S. Work Locations and Key Partners



Organizations Performing Work	Role	Type	Location
Langley Research Center(LaRC)	Supporting Organization	NASA Center	Hampton, Virginia

Primary U.S. Work Locations	
Massachusetts	Virginia

Project Transitions

May 2013: Project Start

November 2013: Closed out

Closeout Documentation:

- Final Summary Chart*(https://techport.nasa.gov/file/138495)*

Project Management

Program Director:
Jason L Kessler

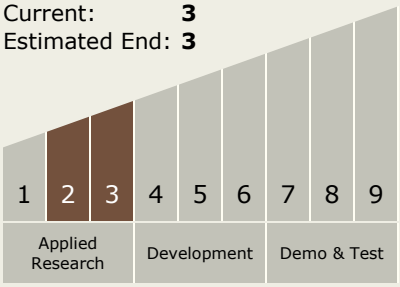
Program Manager:
Carlos Torrez

Principal Investigator:
Jeffrey Chambers

Co-Investigator:
Jeffrey R Chambers

Technology Maturity (TRL)

Start: **2**
Current: **3**
Estimated End: **3**



Technology Areas

Primary:

- TX11 Software, Modeling, Simulation, and Information Processing
  - TX11.4 Information Processing
    - TX11.4.2 Intelligent Data Understanding

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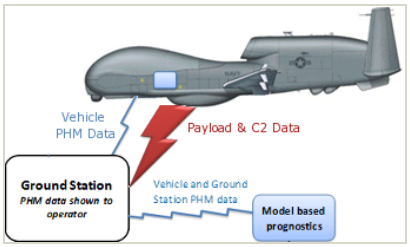
Images



Project Image
Sensor-Free Health Management System
(https://techport.nasa.gov/image/125748)

Target Destinations

The Moon, Mars, Outside the Solar System, The Sun, Earth, Others Inside the Solar System